

An Autonomous Wireless Implementation of IOT based Healthcare Applications

Dr. K. Riyazuddin¹, P.Chandrakala², M Anusha³, Aswini⁴

1(AssociateProfessor, Department of ECE, Annamacharya Institute of Technology and Sciences, Rajampet)

Email: shaik.riyazuddin7@gmail.com

2(IV B.Tech ECE, Annamacharya Institute of Technology and Sciences, Rajampet)

Email:palemchandrakala412@gmail.com

3(IV B.TechECE, Annamacharya Institute of Technology and Sciences, Rajampet)

Email:anusha.madgula1@gmail.com

4(IV B.Tech ECE, Annamacharya Institute of Technology and Sciences, Rajampet)

Email:aswinireddyavanuru@gmail.com

Abstract:

Internet of things (IOT) is a wireless network which interconnects devices for sharing data and information and producing a new information which is stored and can be analysed in future whenever required. The IOT plays a vital role in medical field in providing services to patients and doctors. The idea of this project is to send the health status of patient in which includes blood pressure(BP), heart rate, and ECG directly to the doctor without attending the hospital. This model consists of a system which communicates between network connected systems, Applications and devices that helps the doctors and patients to monitor, track and record patient's vital data and medical information. We are implementing this model on the Raspberry pi zero which uses ARM1176JZF-S ARM core processor and software includes Python which is needed to program Raspberry pi zero which was used to upload our final code of maintaining a database. By using this system doctor can examine his/her patient's current health status and full medical information from anywhere and anytime.

Keywords-Raspberry pi, Internet of things(IOT), Smart sensors

I. INTRODUCTION

In our day to day life we are facing many health problems because we are not caring about ourselves. An average 6316 people are dying all over the world for a day. To overcome such problems we are introduced a IOT Based Smart Health Care kit which included smart sensors to receive information with respective human body temperature, blood pressure, saline level, heart rate, ECG etc, that will be transmitted on an

monitored & analyzed by the doctor, whenever it's required. These databases are stored on server permanently and can be reset via the software. This paper proposes a health monitoring system which is capable of detecting health parameters of our body such as blood pressure, temperature, heart rate, ECG & further transmitting on an IOT server

through 2G/3G/4G GSM technologies. Also in case of emergency like any unusual activity is detected by the patient automatically generating alerts will be sent to doctors and family members. A track of record of body health parameters can be used to identify the disease in a more efficient manner. Now-a-days, people are paying more attention towards prevention & early recognition of health problems. Various sensors have been used like for remote ECG monitoring AD8232 ECG sensor is used, blood pressure sensor is used to measure blood pressure and diastolic pressure. LM35 is a temperature sensor for measuring temperature of skin. [10] By using raspberry pi and IOT a satisfactory work is done in health monitoring, but this paper gives embedded concept of both the platform. By using combination of these, the proposed structure will be more efficient.[8] In this paper, we investigated recent papers related to health monitoring systems and IOT. IOT is the interconnecting of devices and services that reduces human intervention to live a better life. This IOT based health monitoring system helps in finding status of patient, which includes heart rate, temperature and ECG etc. and this information is sent directly to the doctor without visiting the hospital.

II. LITERATURE SURVEY

In early 1960's, Kadish developed a system which consists of a processor, a pump and a glucose sensor, to control glycerin in diabetic patients.[6] In 1970's these medical devices are developed based on microprocessor technologies. Due to the advancements in wireless technologies and energy-efficient design, new applications for wireless devices have been developed which includes remote monitoring, networked micro sensors ect.[9] In 1924, traditional ECG's are developed. In 1992, L.G.linberg and others proposed a new method, which often uses fiber optic probe to monitor heartrate respiration rate at a time. In 1998, J.L. Kalju developed a system, used to design a system for heartrate reconstruction for retie adaptive pacing.

Junaid Mohammad et al [1] monitors patient's ECG wave anywhere in the world using IOIO-OTG Microcontroller. He developed a android application for continuous ECG monitoring and that data will be stored in the clouds.

Mohammad S. Jasses et al [2] mainly concentrated on body temperature monitoring. The raspberry pi will collect the information from the micro sensors that will be connected to the raspberry pi and that will be stored in the cloud websites.

Hasmah Mansor et al [3] monitor body temperature with LM-35 temperature sensor that will be connected to the Arduino-uno board. He created a website to store these values based on login process.

Mathan Kumar et al [4] mainly discussed about heart rate, respiration rate and body temperature. Here he was used a PIC16F887A microcontroller. After collecting all the data from sensors and will be sent to data server for further proceedings.

Karandeep Malhi et al [5] monitor body temperature, heartrate using C8051F020 Microcontroller.

II. IMPLEMENTATION COMPONENTS USED

For implementing the health monitoring system, there is a need of necessary components that are suitable and control the health problems. The components used generally include temperature sensor LM-35, heartbeat sensor, blood pressure sensor, ECG sensor, raspberry pi and GSM module.

A. Temperature Sensor-LM35

It is an IC sensor which is used to measure the temperature with response in voltage linearly proportional to the Centigrade temperature. The LM35 sensor has an advantage of making the conversion of Kelvin to Centigrade over linear temperature sensor; hence it doesn't require external calibration. This is major significance of LM-35 and it is suitable for remote applications. It

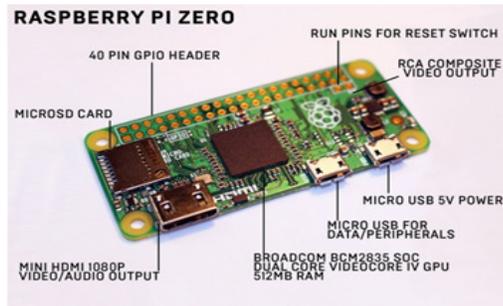


Fig4: Raspberry Pi 0

Compressed video can successfully decrease the bandwidth required to transmit the video through terrestrial broadcast, cable TV, or satellite TV services. The Raspberry-Pi runs on Linux based OS, an open source operating system. In this system we used Rasbin software which is Linux based OS. The programming language python is used for the system implementation for the Raspberry-Pi.

F. Communication network

In health monitoring system, wireless network is used as a gateway between doctor and patient. The main network used here is IOT. The meaning of IOT is Internet of Things, simply called as Internet of everything. Different wireless communication technologies can be used for

- (I) Connecting the IOT device as local networks, and
- (II) Connecting these local networks (or individual IOT devices) to the Internet.

The connectivity technologies are NFC, Bluetooth, zigbee, cellular network etc. In this paper, we use cellular network connectivity because of it has widespread mobile networks like 3G and LTE provide reliable high-speed connectivity to the Internet. However, they have a high power consumption profile and they are not suitable for local network communication.

III. EXISTING MODELS

Health monitoring systems are getting wearable today's, including glucose monitors, ECG monitors, pulse audiometers, and blood pressure monitors. There are two existing methods.

1. Coeey Smart Health:

CoeeySmart health model maintains an automatic database with the help of some Bluetooth enabled devices. This model consists of three monitoring systems namely: 1. Smart Blood Pressure Monitor, 2. Smart Body Analyzer, and 3. SmartGlucometre. This model is a length wise monitoring IOT based system which collects, stores and analyses the raw medical data and it provides alerts. It is a personalized solution for chronic health management. Coeey smart services mainly help to chronic patients and Antenatal care offering.

1. M-Assist: Provides with mobile API for personal health management.
2. W-Assist: Internet connected web based portal that works on mobile devices like laptops and tablets.

2. Health Vault by Microsoft:

Microsoft Health Vault will gather, share, use, and store the health information of the patients. All the health records are placed at one place and they are made available online and can be retrieved in any medical emergency situation and it alerts the patients about their health. It records the data once, and it requires frequent updates about patient's health information. [7] Health Vault-connected applications include websites, compute software, and mobile applications that can help you analyze more out of your captured health information. It also features multi-app connectivity so that the information can be shared with anyone you want.

It features:

- Up-to-date medication.
- keep track of health record
- Authorization and user control

HealthVault not only helps you store, organize, but also give this information to your doctor.

IV. THE PROPOSED METHOD

This System is divided into hardware and software section. Software is responsible for better working of the system, also for interfacing. Both

sections work in parallel process. Hardware is again classified into transmitter section and receiver section. Implementation of transmitter is important part, because transmitter section is directly attached to the patient or human body. Raspberry Pi is a master device in proposed system, and all the other devices like different sensors are connected to it.

A DC power supply of 5V is provided for working of raspberry pi. IOT server is attached to the system; it allows the connectivity for data exchange with other devices. IOT allows connected objects to identify and control remote access across network. The output of temperature sensor and heartbeat ECG is sent to the receiver or doctor end. All the information is first acquired, processed and stored at memory of raspberry pi. The stored information is then transferred to the receiver by means of IOT server.

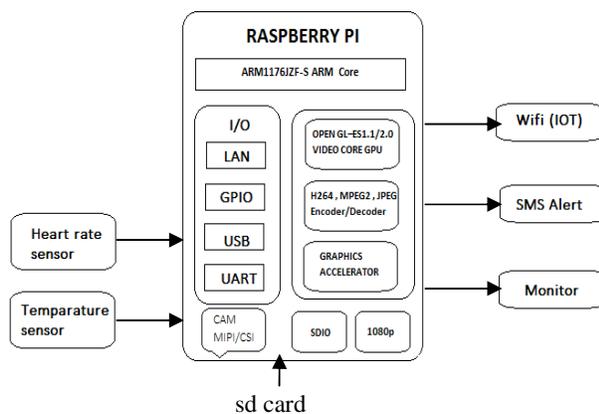


Fig. 5 Transmitter Section

The Receiver section is present at doctor end. At receiver section, all the information is received. Monitor displays the result of each sensor which is attached to raspberry pi.

V. CONCLUSION

In this paper, an IOT based Raspberry-Pi health monitoring is analysed. The main intention behind this proposed system is to facilitate the doctors and providing very good and health efficient services to the patients by maintaining a cloud database so that experts and doctors makes a better use of this data

and provides an efficient solution. This proposed system is very simple, power efficient and easily accessible and it is like a bridge between doctors and patients. Results were shown through hardware equipment.

ACKNOWLEDGEMENT

We are very much thankful to the staff and management of AITS, Rajampet for providing the required resources in the college for the smooth conduction of the project. We are also thankful to all the reviewers for their valuable suggestions.

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research interests includes Embedded Systems and Internet of Things(IOT). She attended many National student Symposiums & workshops.

ABOUT THE AUTHORS:



Dr K Riyazuddin was born at kadapa in 1980. He was graduated from Madina Engineering college kadapa in 2003 and got M. Tech from BITM Bellary Karnataka in 2011. He was awarded PhD from Sunrise University,

Rajasthan in 2017. Presently he is working as Associate Professor in AITS Rajampet. He has published number of papers in Scopus indexed, IEEE indexed and reputed journals. Rajampet. He has published number of papers in Scopus indexed, IEEE indexed and reputed journals.



M Anusha pursuing B.Tech Degree in ECE from Annamacharya Institute of Technology And Sciences (An Autonomous Institution), Rajampet. Her research interest includes Embedded Systems and Internet of Things (IOT). And also member of IET.

She attended many National student Symposiums & workshops.



P. Chandrakala pursuing B.Tech Degree in ECE from Annamacharya Institute of Technology And Sciences (An Autonomous Institution), Rajampet. Her

L. Aswini received Diploma degree from GOVT. POLYTECHNIC, PRODDUTUR. She is currently pursuing B.Tech Degree in ECE in Annamacharya Institute of Technology And Sciences (An Autonomous Institution), Rajampet. Her research interest includes Embedded Systems

and Internet of Things(IOT). She attended many National student Symposiums & workshops.